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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,427	11/09/2001	Thomas Herman	IR-1641	1934

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EXAMINER
LEWIS, MONICA

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 03/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/044,427	HERMAN ET AL.	
	Examiner	Art Unit	
	Monica Lewis	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. This action is in response to the amendment filed January 6, 2003.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 8, 2 and 3 are rejected under 35 U.S.C. 103(a) as obvious over Huang (U.S. Patent No. 6,255,692) in view of Lidow et al. (U.S. Patent No. 4,680,853).

In regards to claim 8, Huang discloses the following:

a) a die of monocrystaline silicon (2a) said die being of a first conductivity and having a first and second surface (See Figure 1);

b) a relatively thin layer of epitaxially grown silicon (2) of said first conductivity type on said first surface (See Figure 1);

c) a plurality of spaced channel regions (12) of a second conductivity type diffused into surface of said layer epitaxially grown silicon (See Figure 1);

d) a plurality of respective source diffusion regions (1) of said first conductivity type, each of respective source diffusion regions being diffused into each of said plurality of spaced channel regions and each said respective source diffusion regions having a smaller area than each of said plurality spaced channel regions, and defining at least one lateral invertible channels region in a space between its periphery of and its respective channel region (See Figure 1);

e) a MOSgate structure overlying each of said lateral invertible channel regions (See Figure 1);

f) a source electrode (21) overlying the top of said die and connected to each of said plurality of spaced channel regions and said respective source diffusion regions, and insulated from said MOSgate structure (See Figure 1);

g) a drain electrode (22) coupled to said layer of epitaxially grown silicon (See Figure 1);

h) plurality of spaced channel regions has a depth less then 3 microns, and said source diffusion has a depth less than .3 microns (See Column 6 Lines 24-64).

In regards to claim 8, Huang fails to disclose the following:

a) channel region of a second conductivity.

However, Lidow et al. ("Lidow") discloses a channel that has a second conductivity type (See Figure 20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Huang to include a channel that has a second conductivity type as disclosed in Lidow because it aids in decreasing the forward resistance of the MOSFET (See Column 1 Lines 25-48).

Additionally, since Huang and Lidow are both from the same field of endeavor, the purpose disclosed by Lidow would have been recognized in the pertinent art of Huang.

In regards to claim 2, Huang discloses the following:

a) first and second conductivity types are N and P respectively (See Column 3 Lines 4 and 6).

In regards to claim 3, Huang discloses the following:

a) lateral invertible channels have a length of less then about 1 micron (See Column 6 Lines 24-64).

In regards to claim 3, Huang fails to disclose the following:

a) distance between source and channel regions at their corner points of maximum curvature is about 2.5 microns.

However, the applicant has not established the critical nature of the dimension of 2.5 microns. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the

applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

4. Claims 4-7 are rejected under 35 U.S.C. 103(a) as obvious over Huang (U.S. Patent No. 6,255,692) in view of Lidow et al. (U.S. Patent No. 4,680,853), Applicant's Prior Art and Kinzer (U.S. Patent No. 5,940,721).

In regards to claims 4-6, Huang discloses the following:

a) a rectangular trench extending through the center of each of said plurality of source regions and into its respective channel region (See Figure 1).

In regards to claims 4-6, Huang fails to disclose the following:

a) a high concentration contact diffusion of said first conductivity type disposed in the bottom of said trench.

However, Applicant's Prior Art discloses a contact diffusion disposed in the bottom of said trench (20) (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Huang to include a contact diffusion disposed in the bottom of said trench as disclosed in Applicant's Prior Art because it aids in serving as a good contact region for the body diode (See Paragraph 7).

Additionally, since Huang and Applicant's Prior Art are both from the same field of endeavor, the purpose disclosed by Applicant's Prior Art would have been recognized in the pertinent art of Huang.

b) source contact filling said trench and contacting said high concentration diffusion.

However, Kinzer et al. ("Kinzer") discloses a source contact (84) filling the trench (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the

invention was made to modify the semiconductor device of Huang to include a source contact filling the trench as disclosed in Kinzer because it aids in providing a connection among the various regions (See Column 4 Lines 60-67).

Additionally, since Huang and Kinzer are both from the same field of endeavor, the purpose disclosed by Kinzer would have been recognized in the pertinent art of Huang.

In regards to claim 7, Huang discloses the following:

a) first concentration type is N (See Column 3 Line 7).

In regards to claim 7, Huang fails to disclose the following:

a) high concentration contact diffusion is a phosphorus diffusion formed with an effective implant energy of greater than about 350keV for a singly charged phosphorus ion.

However, the limitation of "high concentration contact diffusion is a phosphorus diffusion" makes it a product by process claim. The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A *"product by process"* claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972): *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); In re Fessmann, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a *"product by, all of"* claim, and not the patentability of the process, and that an old or obvious product, whether claimed in

"product by process" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

Response to Arguments

5. Applicant's arguments filed January 6, 2003 have been fully considered but they are not persuasive. Applicant argues that "the device shown in Huang comprises a trench type device that has vertically oriented invertible channel regions. Unlike the device shown in Huang, a device according to claim 8 comprises a plurality of lateral invertible channel regions." However, according to Merriam Webster Dictionary, invertible is defined as capable of being inverted and inverted is defined as to turn inside out or upside down. Therefore, since the channel region is invertible it means that it can be turned upside down in a vertical direction.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML
March 11, 2003

AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
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